

NOTE ON REPRODUCTION OF *TURRITELLA*.

By Lieut.-Col. A. J. PEILE.

Read 11th November, 1921.

RECENTLY, while breaking open specimens of *Turritella gunnii*, Reeve, for the purpose of obtaining radulæ, the animal being retracted far within the shell, it was found that two specimens out of three contained fry. The number of young in the shell in which development was more advanced was about 70, having about 4 whorls.

The anatomy of *T. communis*, Risso, was described in the Society's Proceedings, Vol. IV, p. 56, by Dr. W. B. Randles. There is no definite evidence in that paper as to the reproductive habit of *T. communis*, but it would appear possible that some of the anatomical peculiarities there described may be connected with a viviparous mode of reproduction.

The specimens of *T. gunnii* examined were kindly supplied by Mr. Tom Iredale from his Twofold Bay collection, which was dredged by Mr. Roy Bell in 5 to 20 fathoms.

Mr. Iredale informs me that since my discovery he has examined some quantity of *T. gunnii* and found fry therein and that the shells in which they are found are noticeably more swollen in contour than those, presumably males, which he found barren. He also informs me that examination of a number of specimens of an unnamed species, referable to the section *Colpospira*, from the same locality has resulted in no success.

SOME NOTES ON RADULÆ.

By Lieut.-Col. A. J. PEILE.

Read 11th November, 1921.

I HAVE to acknowledge the kindness of the authorities of the British Museum (Natural History), who have permitted me to study the Gwatkin collection of radulæ and to refer to the same in this paper.

I. COLUMBARIUM.

G. Schacko, in *Conchologische Mittheilungen*, vol. ii, 1881, p. 122, described and figured two teeth purporting to be from the radula of *C. spinicincta*, von Martens (= *pagodoides* (Watson)), a species having very close affinities with *C. pagoda* (Lesson). The teeth are stated to resemble those of *Defrancia*; as a result of this statement the genus has been ascribed by von Martens and subsequent writers to the family *Turridæ* (*Pleurotomidæ*) in the *Toxoglossa*.

The Gwatkin collection contains a specimen of a complete radula of *C. pagoda*, from which a figure is now given (Fig. 1). It has

102 rows of teeth, and one of the lateral cusps of the rhachidian is split throughout the series (See III below). Another radula of the same species from a specimen recently presented to the national collection by Mr. A. V. Insole agrees in the arrangement of the teeth, but exhibits a small denticle half way up one side of the centre cusp of the rhachidian.

Though the radula is not typically muricid, I have no hesitation in forming an opinion that the true position of *Columbarium* is in the Rhachiglossa near the *Muricidæ*. On the evidence of shell and operculum *Columbarium* would undoubtedly come near the *ternispina* group. I am unable to find any trace of a pleurotomid groove in the shell. Chinks exist at the base of spines such as are found equally in *M. ternispina* and its allies.

Pending further evidence one can only surmise that the peculiar objects figured by Schacko are limbs of crustacea or some such remains associated with the body of his mollusc which was, admittedly, badly preserved. They do not resemble the teeth of any turrid radula known to me.

II. SOME TURRIDÆ.

From examination of the series in the Gwatkin collection it is evident that if the radulæ be considered in classification some changes will have to be made in the ascription of species to genera. Unfortunately, among the multitude of species, the radula is known in comparatively few.

One of the most remarkable radulæ, differing widely from the other forms already known, is that of *Spirotropis* as figured by Dr. Cooke in the Cambridge Natural History, vol. iii, p. 219, fig. 114. As far as I know it has hitherto been considered peculiar to this northern genus. Pending further research it is worthy of record now that almost identical radulæ are found in two species ascribed to *Drillia*, viz. *D. fucata* (Reeve), from Mauritius, and *D. persica*, Smith, from Karachi. No close affinity between these species and *Spirotropis* would be deduced from shell characters.

III. ABNORMAL RADULÆ.

Any malformation or want of symmetry in a radula is displayed throughout its whole length and evidently depends on some peculiar condition obtaining in the radula sac. This is well shown in simple radulæ such as those of *Marginellidæ*, where the single tooth often has more cusps on one side than on the other as well as small subsidiary cusps adjoining the others here and there. Examples of a malformation and of a subsidiary cusp have been given above in the radulæ of *Columbarium*.

A most surprising asymmetry is shown in the radula of a specimen of *Cypræa caput-serpentis*, L., here figured from the Gwatkin collection. Compared with a normal specimen the following peculiarities are found (Fig. 2, *a* and *b*):—

(a) There are twin rhachidians, rather smaller than the normal but having their main cusps longer and more pointed.

(b) On one side there is a normal lateral but only one marginal instead of two.

(c) The other side has *two* rather small laterals and the inner marginal is rather small.

Other records to hand include Gwatkin specimens of *Maizania wahlbergi* (Benson) and *Theodoxis jordani* (Sowerby), with no trace of a rhachidian, and, in my own collection, *Gena strigosa*, A. Adams, with four laterals on one side and the normal number five on the other.

IV. ACMÆA FLUVIATILIS, Blanford.

The Gwatkin collection contains a specimen of the radula of this species without locality, the type locality being the Irrawady River. Though it agrees with *Acmaea* in the number and arrangement of the teeth, their form is so remarkable as to warrant the creation of a new genus which I propose to designate :—

POTAMACMÆA.

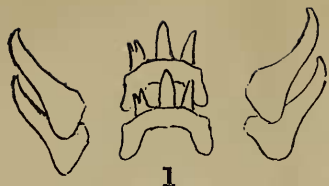
Type species *fluvialis*, Blanford. Only the plan view of the teeth can be determined from the specimen examined and figured (Fig. 3). They differ from those of any other known in being broad and straight with saw edges. The habitat of the animal is peculiar in that, as far as is known, it does not live in salt water. Dr. Annandale informs me that a species lives under similar conditions in the Hoogly, and that his collectors have found it on human corpses. It will be interesting to discover whether this species is the same as that of the Irrawady and whether the latter is prone to a carnivorous diet.

V. SOME AUSTRALIAN RADULÆ.

The material from which the preparations were derived was kindly put at my disposal by Mr. T. Iredale, who received it from Mr. Roy Bell, who obtained it at Twofold Bay, N.S.W. The slides of the radulæ figured are now in the Natural History Museum.

1. The shell described by Pilsbry as *Acmaea saccharina*, L., var. *perplexa*, Pilsbry, = ? *Patella octoradiata*, Hutton (vide Manual of Conchology, vol. xiii, p. 51), proves to be a *Patella* with a radula having a small but well-marked rhachidian (Fig. 4). The radula somewhat resembles a specimen in the Gwatkin collection labelled *P. pentagona*, Reeve, Manila, and specimens labelled *P. cretacea*, Reeve, Tonga. There is also some resemblance to *Patellidea granularis* (L.), as figured by Troschel in Thiele, vol. ii.¹

¹ This figure is not copied in Manual of Conchology, vol. xiii, pl. lii, fig. 6, as stated in the index, and in the text p. 172. Fig. 6 is a copy of Troschel's *Ancistromesus chitonoides* (Reeve).



1



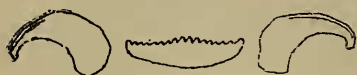
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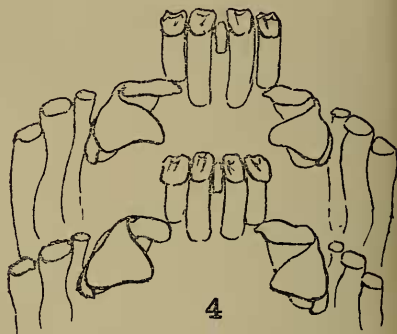
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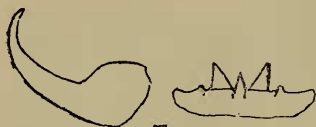
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6



4



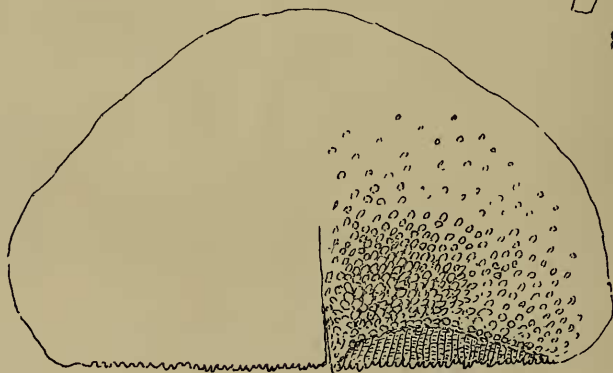
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5a



8



5b

[For explanation of Figures see opposite page.]

FIG. 1.—*Columbarium pagoda* (Lesson). × 230.

FIG. 2.—*Cypræa caput-serpentis*, Lin. × 53. (a) normal, (b) abnormal.

FIG. 3.—*Potamamœa fluviatilis* (Blanford). × 110.

FIG. 4.—*Patella perplexa* (Pilsbry). × 110.

FIG. 5.—*Minolia* (?) *philippensis*, Watson. (a) parts of two rows of the radula. × 110; (b) mandible × 53.

FIG. 6.—*Olivella nympha*, Adams & Angas. × 230.

FIG. 7.—*Belloliva brazieri* (Angas). × 230.

FIG. 8.—*Microvoluta australis*, Angas. × 470.

Patella perplexa would therefore fall in the section *Scutellastra* (H. & A. Adams), as defined by Pilsbry, loc. cit., p. 94. The shell which provided our radula is completely covered with an evenly spread coralline growth. If its habit is to be so covered, this, coupled with its station being below ordinary low-water mark, may account for the animal remaining so long unknown though dead shells are common on New South Wales beaches.

2. One of the most interesting finds among the Twofold Bay material has been that of two species of *Minolia* (?), viz. *philippensis*, Watson, and *pulcherrima*, Angas, with very close affinity to *Machæroplax* (olim *Solariella*) of Northern Seas. Although the shells of *philippensis* and *pulcherrima* differ so that the two species might well be ascribed to different genera, the radulæ and mandibles agree in every particular so far as can be judged in these small specimens which are unusually hard to disentangle. (Fig. 5, a and b.) The marginals naturally fold inwards so as to cover the rest of the teeth, and it is very difficult to spread them outwards without breaking up the specimen. However, after examining two specimens of each species I am able to determine the following points:—

(a) The rhachidian and laterals differ only in minor details from those of *Machæroplax varicosa*, Mighels, as represented in the Gwatkin collection and as figured in Thiele, vol. ii, pl. xxv, fig. 11.

(b) The sickle-shaped marginals are more slender than in *M. varicosa*, but, like them, diverge from the typical rhipidoglossate form.

(c) Locking with the bases of the marginals is a row of broad plates, very difficult to distinguish from the adjacent teeth. I have been unable to locate such plates in the species of *Machæroplax* I have examined.

Both radulæ are comparatively broad and short, with about thirty rows of teeth. A Gwatkin slide of *Minolia* (?) congener, Sowerby, from South Africa, shows a radula of similar type.

Living alongside the above-mentioned Australian species is *Minolia* (?) *angulata*, auctt. The shell of this does not appear to differ greatly from that of a young *M. philippensis*. The radula, however, is of quite a different type, resembling that of *Ethalia*, with degenerate rhachidian and laterals and with marginals of a more normal rhipidoglossate form. Most of the species in the

Gwatkin collection labelled *Minolia* fall in this group, and so do some tropical species labelled *Solariella*, but there are exceptions which, it is hoped, may form the subject of future research.

3. Examination of three species of *Olivella* gives interesting results. *O. nympha*, Adams & Angas (Fig. 6), has a radula with multicuspid rhachidian, which appears to be the normal form in *Olivella*.

O. pardalis, Adams & Angas, and *O. brazieri*, Angas, however, have a tricuspid rhachidian, similar to that of *Oliva* but with a minute additional cusp outside each of the lateral cusps. These minute cusps are well marked in *brazieri* (Fig. 7), but very small and apparently sometimes missing in *pardalis*. A Gwatkin specimen of *brazieri* from Tasmania agrees with the Twofold Bay specimens. All three species are operculate.

I propose for these southern species with tricuspid rhachidians the genus:—

BELLOLIVA

(a name suggested by Mr. Iredale) type species *brazieri*, Angas.

4. The radula of *Microvoluta australis*, Angas, has affinities with those of some of the *Volutidæ*. It consists of a very long ribbon of single unicuspid teeth with deeply indented base and long, sharp-pointed cusp. (Fig. 8.) Evidently, therefore, this species is rightly placed in the *Volutidæ*, although the shell has suggested an affinity with the *Mitridæ*.
